

# Memorandum

To: DEPUTY DISTRICT DIRECTOR, Construction  
AREA BRIDGE CONSTRUCTION MANAGERS  
ALL CONSTRUCTION SENIORS  
ALL RESIDENT ENGINEERS  
ALL STRUCTURE REPRESENTATIVES

Date: October 23, 2001

From: **DEPARTMENT OF TRANSPORTATION**  
**Division of Construction**  
**Mail Station 44**

File: Division of Construction  
Directive CPD 01-13

Subject: Curing Compound

## **BACKGROUND**

Curing of concrete is the process whereby favorable moisture content is maintained to ensure the hydration of cementitious material, resulting in the desired properties of hardened concrete. Curing methods used on exposed concrete surfaces include the Water Method, Curing Compound Method, and Waterproof Membrane Method. Given the choice, contractors will usually choose the Curing Compound Method, due to the low cost, convenience, and ease of use of these materials. Recently there has been a shortage of curing compound and instances of curing compound not passing the loss of moisture requirements specified in Section 90-7.01B.

## **SPECIFICATIONS**

Section 90-7 of the *Standard Specifications* details the requirements for liquid membrane-forming compounds to be applied to fresh concrete surfaces to reduce the loss of moisture during the early-hardening period. White pigmented membrane-forming compounds serve the additional purpose of reducing the temperature rise in concrete exposed to the sun. Curing compounds should be applied to the surface of fresh concrete as soon as the bleed water evaporates from the surface of the concrete. After the curing compound is applied, it is intended to form a continuous film that completely seals the surface thereby retarding or reducing evaporation of moisture from concrete.

## **EXISTING PROCESS SAMPLING AND TESTING**

For curing compounds to perform as intended requires that the contractor and resident engineer monitor that the material supplied to the job site has been sampled and tested either at the source of supply or at the job site, or at both locations. Currently the Office of Materials Engineering and Testing Services (METS) assigns personnel for inspection of materials at the source of supply based on the information submitted, by the contractor, in Form CEM-3101, "Notice of Materials to Be Used." The resident engineer reviews Form CEM-3101 for accuracy and completeness, and forwards an acceptable completed Form CEM-3101 to METS. Upon receipt of the Form CEM-3101, METS will assign inspection of the curing compound at the source of supply and submits a Form TL-0608, "Notice of

Materials to be Furnished,” to the supplier, contractor and the resident engineer. The METS inspector will obtain a representative sample for testing by METS Chemistry Branch. If the curing compound is found to comply with the requirements of the specifications; then a Form TL-0624, “Inspection Release Tag” is attached to the acceptable lot of curing compound. The resident engineer may obtain a sample of the curing compound from the spray bar and submit the sample for testing for compliance with the moisture loss requirement when tested per California Test 534. The Department reported substantial failures both at the site of manufacture and at the job site. Faced with the potential risk and liability of failed curing compound sampled at the job site, the manufacturer has responded by producing smaller quantities and shipping curing compound only after positive test results are obtained from METS Chemistry Branch.

#### **REVISED PROCESS SAMPLING AND TESTING**

In order to expedite the testing process, the Department and Industry have agreed to acceptance of curing compound by certificate of compliance, which includes the results of the manufacturers quality control testing. In addition to specified testing, the manufacturer will perform three ‘fingerprint’ tests, which are indicators of the physical and chemical properties of that batch of curing compound. These ‘fingerprint’ tests will be the basis of acceptance of samples obtained from the shipping containers or from samples obtained at the job site. METS source inspectors will issue a Form TL-0624 for shipments, which have a certificate of compliance, which meets the requirements outlined in the Departments letter to Western States Chapter American Concrete Pavement Association (WSCAPA) dated October 23, 2001. The resident engineer should inspect each shipment of curing compound arriving at the jobsite for an approved Form TL-0624, which shows the identifying lot number, the inspector’s initials, and the date of inspection. Curing compound that is not properly identified shall not be used.

The resident engineer shall obtain, from the contractor, a copy of the certificate of compliance for each shipment to be included in the project records. Field samples obtained for quality assurance testing shall be obtained for each shipment or each time a brand is changed. Since testing of the curing compound may require at least a week from the time that samples are shipped; it is highly recommended that, whenever possible, the resident engineer sample the curing compound prior to the start of placing concrete (this testing is to ensure the contractor has the proper equipment to fully mix the curing compound before use). During concrete placement, samples may be obtained from the spray nozzles if care is used to prevent excessive loss of the solvent by evaporation, or samples can be obtained from a valve in the feed or recirculation lines of the sprayer. Each sample shall consist of a 1 L can, which must be identified with the source lot number and shipped immediately to the Translab at 5900 Folsom Blvd., Sacramento CA, 95819, attention Chemical Testing Branch.

In addition, periodic test samples should be obtained and tested as outlined in Section 8-01-8 of the *Construction Manual* and those sections in the Bridge Construction Records and Procedure Manual, the contract documents or as outlined in this directive.

To verify the application rate, perform CT 535, "Determining the Application Rates of Concrete Curing Compounds in the Field." Visually inspect the curing compound to ensure that the application of the curing compound is uniformly applied without runs, sags, thin areas, or skips. The contractor shall immediately correct any deficiencies in application of the curing compound.

The resident engineer shall inspect the fresh concrete for shrinkage cracks. This type of cracking is distinguished by short, irregular cracks that occur while the concrete is still plastic. Immediately notify the contractor when shrinkage cracks are discovered. If shrinkage cracks are discovered, immediately direct the contractor to take corrective measures. This may include applying a fog spray to the affected pavement surface to raise the relative humidity of the ambient air.

Upon notification that tested field samples of the curing compound do not comply, the resident engineer shall order the contractor to cease the use of the non-compliant curing compound. The contractor shall be allowed to continue production of Portland Cement Concrete (PCC) paving only after the resident engineer is assured that the cure as applied complies with specification.

#### **Action - Contract Change Order**

The Division of Construction is recommending that, for PCC paving and bridge deck construction projects that require curing compound, the resident engineer is to execute a change order to allow the acceptance of curing compound by Certificate of Compliance.

This change should be documented by a "no cost" district or region approved contract change order.

FHWA concurrence has been obtained, and there is no need for the Division of Construction's approval of a no-cost contract change order resulting from this specification change.

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A sample contract change order is attached for the resident engineer's use.

If you have any questions regarding this issue, please contact Austin Perez at (916) 227-5705

Original signed by John McMillan  
for:

ROBERT PIEPLOW  
Chief  
Division of Construction

#### Attachments

c: JMcMillan  
PStolarski, METS  
PBenson, METS  
DSpeer, METS  
ARogerson, METS  
LDobeck, METS  
JDobrowolski  
SJarvis  
Construction Coordinators  
DValls, Structures Construction  
KHerritt, Division of Design

REFERENCES

Senbetta, E., "Curing and Curing Materials," Significance of Tests and Properties of Concrete and Concrete-Making Materials, ASTM STP 169C, American Society for Testing and Materials, Philadelphia, 1994, pp. 478-483.

Standard Special Provision, S11-C01 dated May 11, 2001, State of California Department of Transportation, Section 90-7.01B, "Curing Compound Method", Section 90-7.02, "Curing Pavement"

Construction Manual, California Department of Transportation, 2001, Sections 4-28, "Lean Concrete Base"; 4-40, "Portland Cement Concrete Pavement"; 6-1, "Sampling and Testing", 6-2, "Acceptance of Manufactured Materials and Sampling Methods"

Design and Control of Concrete Mixtures 13<sup>th</sup> Edition, Portland Cement Association, Chapter 10, "Curing Concrete"

JD:sa